

Chapter 1: Introduction

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Overview

The explosive growth in voluntary environmental programs since the early 1990s in the U.S., Europe and Japan reflects, in part, the changing societal attitudes about the environment and a growing optimism on the possibility for enhanced cooperation between government and business. It also reflects the widespread frustration with the long and expensive battles often associated with new environmental regulations. In most cases, voluntary programs are being used to control pollutants that have not yet been regulated and for which legislative authority may be difficult to obtain. Unlike market-based approaches to environmental management, where the conceptual roots are largely academic, voluntary programs have emerged as a pragmatic response to the need for more flexible ways to protect the environment.

The key question considered in this volume is whether or not these programs actually work as advertised? That is, do voluntary programs deliver the promise of significant environmental gain without the burdens associated with mandatory regulation? Do they improve environmental and conservation outcomes relative to a realistic baseline, or do they pave the way for other actions that do? Quantitatively, how large are the likely gains? Can such approaches serve as a substitute for mandatory requirements or should only modest gains be expected from these efforts?

The existing literature -- which primarily emphasizes the motivation of firms to participate rather than the environmental accomplishments of the programs -- provides only limited answers to the questions above. Most studies have focused on the 33/50 program in the United States, which is aimed at cutting toxic releases. A unique feature of this program, which facilitates performance evaluation, is that relevant emissions data from the Toxics Release Inventory (TRI) are routinely collected for both participating and non-participating firms. While this volume contains an updated analysis of 33/50 as well, the remaining six of seven case studies address carbon- or energy-related programs. This intentional focus reflects both the increasing attention given to voluntary climate change and energy efficiency programs, as well as the limited existing work in this area.

Although there are many flavors of voluntary programs -- often grouped by whether the parameters of the program originate in the private sector, the public sector, or are negotiated between the two -- all of them involve some form of commitment to improve environmental performance beyond the existing legal requirements. Government is often directly involved in setting the goals and monitoring the results, although that need not be the case.

The growing popularity of these programs is undeniable. A 2005 survey identified 87 voluntary programs at the U.S. Environmental Protection Agency, up from 54 in 1999 and 28 in 1996 (U.S. EPA 2005). In fiscal year 2006 voluntary programs comprised 1.6 percent of EPA's operating budget. Dozens more programs operate at the U.S.

Department of Energy and other federal agencies, and at the state level. Issues covered include climate change, energy, waste, water, toxics and agriculture. In Europe, voluntary programs also address a variety of environmental issues, although most are focused on climate change. The European Environmental Agency (1997) reported that more than 300 voluntary agreements have been established between national governments and industry associations, with the Netherlands and Germany accounting for about two-thirds of them. In Japan, the focus is on so-called self-regulating mechanisms, mostly involving single firms working with local agencies (Baranzini and Thalmann 2004). A 1999 paper reported that Japan has more than 30,000 such arrangements (Tsutumi 1999). The largest program is the Action Plan on the Environment, initiated by the Keidanren in 1997, an association of large firms, mostly in energy-intensive sectors.

In principle, voluntary programs offer opportunities for business to get ‘hands on’ experience with new types of environmental problems without the straightjacket of regulation and, in the process, to enhance their environmental reputation with government, customers, investors, communities, employees, and other firms. In some cases, the firms’ participation may represent an effort to shape future regulations or to stave off mandatory requirements altogether. Some or all of these benefits may be reflected in the firms’ bottom line, over the short and/or long term.

Voluntary programs also provide opportunities for government agencies to gain experience with new problems and new industries. Most importantly, they provide

opportunities to achieve environmental improvements more quickly, with lower administrative costs than otherwise possible and, sometimes, via more holistic approaches than the media-specific, end-of-pipe focus of most existing legislation. In the view of some observers, by encouraging proactive approaches from industry, voluntary programs may help foster a common understanding of both environmental problems *and* the mutual responsibilities to address them.¹

Notwithstanding the many potential benefits of voluntary approaches, the absence of deliberate price or regulatory signals to encourage fundamental changes in corporate or consumer actions or stimulate demand for cleaner technologies, is a clear limitation. The term regulatory capture applies when the targets established for the voluntary programs reflect only a ‘business as usual’ scenario. Free riding, wherein some firms avoid any effort while other, proactive firms voluntarily address a problem and keep further regulation at bay, may be an issue with certain voluntary programs. Taking this a step further, voluntary approaches may represent a shift in emphasis from the “worst” polluters to those most willing to abate on their own initiative. Some, particularly in the environmental community, see voluntary programs as a distraction from the real work of taking mandatory action.²

Since business is inherently dynamic, with firms constantly confronting new challenges, opportunities and technologies, it is not sufficient to simply look at two distinct points in time to see if firms’ environmental performance has improved. Rather, environmental gains must be assessed with reference to a credible representation of what would have

happened otherwise. Defining such a baseline is, of course, quite difficult to do. One approach is to construct a business-as-usual forecast using the best available data. However, such an approach is limited by the large number of unpredictable influences on outcomes. An alternative is to compare participants to a suitably chosen group of non-participants. Still, biases may arise if participants and non-participants differ in some systematic way – for example, if participants are bigger, faster growing, or better managed. Unless the comparisons are carefully constructed, observed differences between participants and non-participants may reflect factors other than the effects of the program.

If we imagined a laboratory setting, the most transparent way to measure the environmental performance of a voluntary program—or any program—would be to conduct a scientific experiment to see whether firms randomly assigned to the program exhibited different outcomes than those randomly assigned to a control group. Because the two groups would be otherwise identical (due to randomization), this would yield an unbiased estimate of the effect of the voluntary program on environmental performance. In real life, we rarely see such randomized experiments and are instead left with either forecast baselines or imperfect control groups. This provides only limited evidence on the environmental performance of participating firms compared to what realistically would have happened otherwise.

Getting credible answers to these questions is important. Protagonists and antagonists of the trend towards voluntary approaches are increasingly at odds, sometimes drawing

opposite conclusions about the same program. Protagonists, typically on the side of industry, see voluntary programs as a more practical, flexible approach to regulation. Antagonists, including some environmental advocates, often see voluntary programs as an obstacle to more stringent, mandatory programs. This polarization may be partly a consequence of poor information. While intuitions and anecdotes may provide some reason for believing that a given program has or has not had a beneficial environmental impact, careful empirical analysis with peer review is much more convincing. The goal of this volume is to help fill that void.

The Existing Literature

The literature on voluntary programs contains a variety of descriptors to identify particular mechanisms: self-regulation, negotiated agreements, environmental covenants, business-led environmental strategies, and others. Nonetheless, a loose taxonomy has evolved with three reasonably distinct bins based on how the parameters of the commitment are determined:

- *Unilateral agreements by industrial firms.* Business-led corporate programs fall under this heading as do commitments or reduction targets chosen by firms or industry associations. Examples of such agreements in the U.S. include the Chemical Manufacturer Association's 'Responsible Care' programs for reducing chemical hazards, and McDonald's replacement of its Styrofoam 'clamshell' containers with paper packaging. In Germany the Industry and Trade

Association's plan to reduce carbon dioxide emissions was also a unilateral agreement. The study in this volume of the German Cement industry is part of that plan.

- *Public voluntary programs* in which participating firms agree to protocols that have been developed by environmental agencies or other public bodies. Although the public agencies may promote the programs to industry, they do not generally negotiate over the specific terms. Eligibility criteria, rewards, obligations and other elements are established by the public agencies. Examples of such programs in the U.S. include the 33/50 program, Climate Wise, and the residential demand-side management (DSM) programs operated in California.¹ All three of these programs are subject to in-depth examination in this volume.
- *Negotiated agreements*, consisting of a target and timetable for attaining the agreed upon environmental objectives, are created out of a negotiation between government authorities and a firm or industry group over specific terms. In some cases, participating firms receive relief from an otherwise burdensome tax, making the voluntary notion of the program somewhat hazy. In many countries firms are held liable for compliance on an individual basis while in others, e.g., Japan, industries are generally liable on a collective basis for the environmental performance stipulated in the agreements. Examples of negotiated agreements, which are most frequently used in Europe and Japan, include the Danish program on industrial energy efficiency, the Voluntary Climate Agreements in the U.K.,

¹ In the case of the DSM programs, households are the target of participation rather than firms, and utilities play the role of the government agency, establishing the terms of the program.

the Keidanren Voluntary Action Plan on the Environment in Japan (all three examined in this volume). The French agreement on the treatment of the end-of-life of vehicles and the U.S., the XL program are further examples of negotiated agreements.

It is worth noting that while the delineation into these three categories may seem clear cut, virtually *all* voluntary programs involve some degree of dialogue between government and firms over various terms. The dialogue may be indirect or informal, and may feature stronger or weaker positions on each side. Hence these categories highlight whether the terms are overwhelming determined by either firms or government with only informal dialogue in the first two categories, or whether there is more give and take and typically more formal interactions in the latter.

Economic analysis suggests that since environmental mitigation typically is not costless and the benefits not appropriable by the firm, profit maximizing firms have little incentive to undertake such activities unless mandated by government to do so. It is not surprising, therefore, that as measured by the number of articles or books published on the subject, by far the dominant issue in the academic literature on voluntary programs concerns the *motivation* for firms to participate in the programs. Extensive theoretical and some empirical work has focused on the importance of pre-empting regulatory threats, the potential to influence future regulations, the impacts on stakeholder relations and the firms' public image, the importance (or unimportance) of technical assistance and financial incentives to the firms' participation decision, the economic efficiency of the

programs, the role of competitive pressures, and the potential to bring about savings in transaction and/or compliance costs. Several studies have shown the importance of public recognition provided by participation in a voluntary program to be a key motivation for firms.²

While the literature on the motivation for firms to participate in voluntary programs is extensive, there are only a limited number of previous analyses of environmental performance. The largely theoretical work on the issue suggests that participation in voluntary programs does not guarantee an improvement in actual performance. While it may encourage the exchange of information about best practices, a key factor may be to provide insurance to firms against stakeholder pressure. Thus, by implication, it might be argued that participation in voluntary programs may actually *reduce* incentives to cut emissions if it is successful in staving off stakeholder pressure for more stringent actions. Theoretical studies have shown that improvements in actual environmental performance depends on the extent to which voluntary programs lead to lower abatement costs relative to mandatory regulations, the likelihood that regulation will be imposed even if the program is not effective, the extent to which the regulator is willing to subsidize pollution reduction, the willingness of consumers to pay for ‘green’ products, and other factors.³

In considering environmental performance of voluntary programs it is useful to distinguish between those programs that focus on the adoption of particular technologies

² For reviews of this literature see Khanna (2001), Lyon and Maxwell (2002). See also Arora and Cason (1995, 1996); Celdren et. al. (1996); Khanna and Damon (1999).

(e.g., Green Lights, now part of the Energy Star Program) and those that focus directly on environmental performance (e.g. 33/50, Climate Wise, or various audit-based programs). In the former, success is measured as adoption of specific technologies. In the latter, it is measured as a reduction in emissions. In both cases there is the need to define a baseline: measured over the same period, how many firms (or households) would have installed the technologies, or how much would emissions have been reduced, even without the voluntary program?⁴

Technology programs can be difficult to evaluate because of the general absence of comprehensive databases on the performance of facilities which have not adopted the particular technologies. Despite this limitation, a number of these programs have been subject to at least some evaluation. The Green Lights Program is an innovative, voluntary, pollution prevention program sponsored by the U.S. Environmental Protection Agency focused on the installation of energy efficient lighting where profitable and where lighting quality can be maintained or improved. DeCanio (1998) finds that the energy-efficiency investments carried out under this program yielded annual real rates of return averaging 45 percent. DeCanio and Watkins (1998) find that specific characteristics of firms affect their decision to join Green Lights and commit to a program of investments in lighting efficiency.⁵

Energy Star is a voluntary labeling program designed to identify and promote energy-efficient products to reduce greenhouse gas emissions. Dowd et al. (2001) cites specific product purchase decisions being influenced by Energy Star, including a number of

favorable ‘soft’ and ‘dynamic’ effects associated with the program.^{6 7} After reviewing the evidence on Green Lights and Energy Star, Howarth et al. (2000) concluded that “voluntary agreements between government agencies and private sector firms can...lead to improvements in both technical efficiency of energy use and the economic efficiency of resource allocation.” (page 484) Unfortunately, none of these studies was able to distinguish between the improvements attributable to the voluntary programs and those changes that likely would have taken even without the programs.

The empirical evidence is more extensive, though still mixed, when we look at programs focused explicitly on environmental performance as opposed to technology adoption, particularly with regard to toxics where there has been extensive analysis using TRI data. What is probably the gold standard in the field is an in-depth analysis of the 33/50 program by Khanna and Damon (1999) who jointly modeled the decision to participate in the program as well as the actual outcomes. They first recognize that a firm’s decision about the quantity of covered releases to emit will likely depend on both its participation in 33/50 and such factors as stakeholder pressure, output levels, and others. They then allow for the participation decision to both depend on these same variables and to be correlated with the volume of releases. Using publicly available firm-level data, they find a statistically significant impact of the program on toxic releases as well as on firms’ return on investment and long-run profitability. Khanna and Damon hypothesize that the incentives for participation arise from three sources: program features, the threat of mandatory environmental regulations, and firm-specific characteristics.⁸

Focusing on the period 1988-1995, Sam and Innes (2005) also find that participation in 33/50 lowered releases of the covered chemicals, particularly in 1992. Further, they find that participation in 33/50 was associated with a significant decline in EPA inspection rates for the years 1993-95. A study by Gamper-Rabindran (2005) found that while the effects varied by industry, in the case of the largest participating industry, namely chemicals, the positive results that 33/50 reduced toxic releases (reported by Khanna and Damon (1999)) are actually reversed when the analysis excludes two ozone depleting chemicals whose phase-out was mandated by the Clean Air Act. Khanna has authored a new case study in this volume which reviews and updates the extensive literature on 33/50.

King and Lenox (2000) analyze the environmental impact of firms participating in Responsible Care, an industry-sponsored effort to cut toxic releases distinct from the government-sponsored 33/50. Using pooled and panel data for the period 1991-1996, they find that participants were reducing their releases more slowly than non-participants. Their fixed-effect model shows that Responsible Care had an insignificant effect on environmental performance. That is, despite the improved performance of the chemical industry over the studied period, the rate of improvement was not greater than in pre-program years and, most surprisingly, it was slower than among non-members than for participants in Responsible Care.

Moving Beyond Toxics, a paper by Dasgupta, Hettige and Wheeler (2000) focused on the adoption of ISO 14001 management practices by Mexican firms. They found a

significant improvement in the (self-reported) compliance status of participating firms. They also find that explicit environmental training programs for non-environmental workers led to an improvement in compliance status of the firms.

Turning to energy and climate change, an analysis of the U.S. Department of Energy's Climate Challenge Program on CO₂ emissions focused on the largest 50 electric utilities east of the Rocky Mountains from 1995-1997 (Welch, Mazur and Bretschneider (2000)). Despite a number of intriguing results about the motivation of firms to participate in Climate Challenge, the authors find that adoption of the program seems to have no effect on emissions. In fact, those firms predicted to volunteer higher reduction levels were found to reduce their CO₂ emissions less. The authors hypothesize that the poor program performance is associated with the lack of at least a tacit regulatory stick of the type present in 33/50.

Overall, the literature is characterized by a paucity of empirical studies on the actual environmental performance of voluntary programs and, equally important, an almost exclusive focus on toxics as opposed to energy or climate related programs. As is well known, energy issues differ from toxics in many ways, including the extent to which financial incentives are already in place to reduce emissions. That is, market forces already encourage conservation and energy efficiency, whereas no such forces exist to reduce toxic emissions. Thus, the potential for voluntary programs to achieve reductions in energy-related carbon dioxide emissions may be more limited than the potential associated with toxics. A key motivation for this volume is to increase the attention paid

to the rigorous study of program results and to emphasize rapidly growing interest in energy and greenhouse gas-related programs.

Programs Studied in this Volume

The seven case studies presented in this volume cut across multiple sectors, industries and countries and represent a range of different approaches to achieving voluntary cooperation of participating firms and, in one case, households. As noted, only one focuses on toxic releases while the other six involve energy use or greenhouse gas emissions. The programs entail a mixture of unilateral agreements, public voluntary programs, and negotiated agreements. The selected programs, case study authors and other descriptive information are shown in Table 1-1.

[Insert Morgenstern and Pizer **Table 1-1 Here**]

No claim is made that these cases are representative of the thousands of voluntary programs in operation in the U.S., Europe, or Japan. Rather, the cases were chosen somewhat opportunistically, largely because of the existence of the type of information needed to conduct an in-depth study with a focus on environmental performance. The selected programs are of sufficiently high profile to warrant detailed studies and they were established early enough – mostly in the 1990s -- so there is now an actual record of their performance. Because our focus is on comparing the environmental results of participants in voluntary programs to a credible baseline, most of the selected programs are ones for which either a representative sample of non-participants or a historical / negotiated baseline is available. Arguably, these selection criteria omit newer, potentially

improved programs without a track record as well as those for which a comprehensive sample of non-participants or baseline is not readily available. These limitations must be balanced against the consequent depth and rigor of the analysis possible with the programs we do examine. Overall, we believe the insights gained from this approach for evaluating the environmental performance of voluntary programs outweigh the limitations.

The chapter authors themselves represent a diversity of expertise on voluntary programs, each with considerable prior knowledge of and familiarity with the subject programs. As part of the process for developing and evaluating the contributed papers for this volume, an authors' workshop was held at Resources for the Future in December 2005 to discuss the cross-cutting methodologies and initial results of the individual studies. In the course of the workshop outside reviewers provided comments on each of the chapters (in addition to peer reviewers who commented during an editorial process).⁹ As editors, our goal has been to leverage the authors' previous work and to press them to develop practical and accessible information for the policy community on the environmental performance of these programs.

Questions for the Case Study Authors

The assignment for each author or team was to consider three broad issues related to the individual voluntary programs: (1) the context, (2) the design, and (3) the performance, of the programs.

Program Context: We asked authors to begin by describing the circumstances surrounding the voluntary program. This question can be broken down into several pieces. First, what events have taken place, or are expected to take place, that might influence either program participation or outcome? For example, rising energy prices that coincide with instigation of an energy efficiency program might affect both participation in the program and energy use directly. Or rising public concern about toxic chemicals might spark interest both in a voluntary program and in action to thwart that concern. Second, does creation of the voluntary program signal anything about the future? Many people in the U.S., for example, might have viewed President George W. Bush's announcement of new voluntary climate initiatives as a signal that any mandatory climate policies remain a ways off. Similarly, negotiated agreements in Europe might be viewed as forestalling regulations in the sectors where they exist.

Understanding program context is important to comparing both participation and outcomes across countries. Otherwise identical programs, where one carries the threat of further action, or where one is accompanied by changes in energy policy or prices, may see dramatically different outcomes. While some contextual features are clearly associated with national differences, it is important to draw them out in the comparison. In the UK and Danish Climate Change Programs, for example, participants were offered an 80-100 percent reduction in the newly adopted energy tax in exchange for a quantified commitment to reduce their energy or CO₂ emissions.

Program Design: We next asked authors to describe the goal of the program and what participation requires. Programs can be categorized as to whether participation is based on qualitative or quantitative commitments. Qualitative commitments might involve reporting emissions and/or abatement activities undertaken. Or they could require use of particular technologies—improved insulation or efficient light bulbs. Quantitative commitments would be to reduce emissions or energy use in either absolute or relative (to output) terms.

We are particularly interested in how program design features affect participation and outcomes. Policymakers may have little influence over national circumstances but certainly can affect program design. Some of the most important lessons we hope to draw are how different features increase or decrease program effectiveness.

Program Outcomes: How has the program been evaluated, and what were the results of that evaluation? There are a variety of ways that programs can be evaluated, ranging from self-reported results—or even casual observations—by participants or program administrators, to careful studies that attempt to simulate the effect of a randomized experiment. In some cases there may be quantitative reports on the outcome of interest—energy use or emissions—and in some cases there may only be qualitative information about participation, “soft effects,” or long-term assessments. While our choice of programs and authors is based in part on their ability to provide an analysis based on their existing work, several authors have conducted entirely new quantitative analyses for this volume.

How should outcomes be measured? Absent a randomized experiment, we are forced into making assumptions about the appropriate *baseline* from which to measure progress for program participants. Perhaps there are historic outcomes or other information that can be used to forecast a business-as-usual baseline for comparison to results after the program's inception. Perhaps data exists on similar groups of participants and non-participants. Finally, there may be reports of actions and consequences related to participation, with the assumption that the actions would not have happened absent the program. All these non-experimental approaches have some flaws and potentially give rise to bias in the estimated program benefits. We have encouraged authors to discuss these biases in their analyses.

Variation in baselines, as well as outcome metrics, could pose problems for our comparison exercise, but it also presents opportunities. It is important to understand why some programs appear to have been more successfully evaluated than others, and whether there were program design details that might make future evaluation easier. It is also valuable to consider other quantitative indicators, such as participation levels, as well as qualitative results reported by stakeholders, such as shaping attitudes and improving management. We anticipate that by putting policy evaluations across programs and countries side-by-side, we will see patterns of effectiveness even when outcome measures are not directly comparable. The idea that the collective evaluation of multiple programs will be more compelling than the sum of the individual evaluations is, in part, what motivates this exercise.

Advice to the reader and practitioner

Despite the preceding caveats, readers are encouraged to focus, as the authors do, on the program outcomes. Do these programs generate significant environmental improvement without the burdens associated with mandates? How large are the gains? Are they greater than those likely to have been achieved without the program in place? Is it realistic to expect the programs to substitute for formal regulation over the long term or are they just a way to start the process in the absence of legal or political mandates to go further?

Another issue to think about is the incentives for firms to join voluntary programs in the first instance and, particularly, the effect of the different incentives on the likelihood of joining and/or actually improving environmental performance. In fact, the incentives in place in the seven case studies are quite disparate. Two of the programs reward participants with specific rebates from major new energy or carbon taxes adopted to address climate change. In several other programs there is a clear expectation of mandatory requirements if firms fail to join and, most importantly, reduce their emissions. In others, the expectations are less clear. The key question is how or to what extent do these incentives affect environmental results.

A related issue is the selection of targets for the programs, as highlighted by the taxonomy described earlier. In some cases the targets were selected unilaterally by

industry. In others, the government set ground rules to which firms or households chose to join. In yet others, there was a two-way dialogue between participants and government to arrive at specific terms. Does government involvement make a difference in the stringency of the targets established? Is there evidence of regulatory capture, wherein the targets chosen may represent little more than business-as-usual?

Finally, there are some interesting methodological issues running through the seven cases – issues that affect the robustness of the evaluations themselves and, quite possibly, might have application in the design of future programs. As noted, 33/50 is unique in that the reporting system, the Toxics Release Inventory, applies equally to participants and non-participants alike. None of the other programs studied has such a built-in reporting scheme. Yet, all the other authors have endeavored to address the same basic issues about program performance, with some using a control group and others relying on a forecast baseline. The reader should consider the different methods and assess their relative usefulness for evaluation.

In the final chapter of the volume we return to all of these issues and consider how they cut across the different cases.

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¹ This point has been emphasized by the European Environmental Agency (1997).

² For a discussion of the limits of voluntary programs, see Gardiner (2002).

³ For reviews of this literature see Khanna (2001), Lyon and Maxwell (2002), Alberini and Segerson (2002), Khanna and Ramirez (2004), Baranzini and Thalmann (2004).

⁴ Guidelines issued by the European Commission in 1996 were designed to address evaluation issues, in part, by requiring greater quantification of objectives, better monitoring, and more transparency in

reporting. To our knowledge, no recent assessment of these European programs has been conducted since the guidelines became effective.

⁵ A substantial literature exists on the characteristics of firms that join voluntary programs of all types. For example, in addition to Green Lights, studies have been done on the characteristics of firms joining 33/50, Climate Challenge, Waste Wise, as well as for adopting ISO14001. See Khanna (2001) for discussion.

⁶ For example, citing work by Laitner (2001) they note “increased awareness of the benefits of energy-efficiency equipment.” They also note that “80 percent of consumers surveyed were familiar with the logo; and more than 40 percent used logo in purchase decisions.”

⁷ See also Oak Ridge, 2000 and Laitner and Sullivan, 2001.

⁸ Khanna and Damon (1999) consider the threat of mandatory penalties by comparing firms currently listed as responsible parties for a larger number of Superfund sites to those with a smaller number of sites—arguing that the former are more likely to be aware of the liability costs of continuing to generate their past levels of toxic pollution. Similarly, they model a series of firm-specific characteristics such as innovativeness, age of existing equipment, membership in industry trade associations, and volume of toxic releases that might be expected to influence the costs and benefits of participation and thus the participation decision.

⁹ The following individuals served as peer reviewers: Tom Lyons, Terry Dinan, Bob Shackleton, Joe Aldy, Janet Peace, Andreas Lange, and Kathleen Hogan.

Table 1-1: Selected Characteristics of Case Studies

Program	Author(s)	Years of Operation	Energy, CO₂ (GHGs), or Toxics	Industry or Household	Program Type
33/50 (US)	Khanna	1991-1996	Toxics	Industry	Public Voluntary Program
Japanese Keidanren	Wakabayashi and Sugiyama	1997-	CO₂	Industry	Negotiated agreement
UK Climate Change Agreements	Glachant and Muizon	2001-	CO₂	Industry	Public Voluntary Program
Danish Energy Efficiency Agreements	Krarup and Millock	1996-	CO₂	Industry	Negotiated agreement
German Cement Industry	Bohringer and Frondel	1995	CO₂	Industry	Unilateral agreement
Climate Wise (US)	Morgenstern, Pizer and Shih	1993-2000	GHGs	Industry	Public Voluntary Program
California Demand Side Management	Sanstad	Early-mid 1990s	Energy	Household	Public Voluntary Program